**Annual Report: DETERMINING INTERANNUAL VARIABILITY IN VEGETATION STRUCTURE AND EXPLORING PLANT LEAF DECOMPOSITION AND FUNGAL METABOLISM AT WILD BASIN WILDERNESS PRESERVE**

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**INTRODUCTION**

Resampling fixed plots and/or transects within plant communities represents one of the strongest methods of change detection of ecosystem structure and function (e.g. Callaghan et al. 2011). While informal qualitative understanding of the vegetation structure has existed for the Wild Basin for some time (Williams 1977, Respes 1987), a formal quantitative assessment of the vegetation structure took place in 2013 and was repeated in 2014 (Johnson et al. 2013, 2014). Within Wild Basin, five distinct vegetation communities were identified. The dominant drivers of vegetation structure were identified as percent canopy cover as well as soil sand content (Johnson unpublished data). Specifically the Edwards Plateau, and Central Texas more generally, often experiences high interannual variability in both temperature and precipitation. Because native plant species have evolved within the landscape

experiencing this variability, they have hypothetically adapted to respond phenologically to this interannual variation. Thus, vegetation structure may differ year to year within Wild Basin and similar landscapes.

We resampled transects and plots, originally surveyed in 2013, for plant community composition in Wild Basin Preserve in the early summer 2015. These plots and transects were near photo-points located throughout the preserve (Figure 1). This study augments both the long-term management goals of Wild Basin within BCP (Forest for the trees 1999, BCP Land Management Plan 2005) and allowed students from St. Edward's University first-hand experience conducting vegetation surveys. Plant community data was added to the database with the prior years, and change detection is currently in progress. Additionally, we continued to explore the relationships between ecosystem structure and function. In 2014, we documented leaf litter decomposition of three dominant tree species (*Quercus fusiformis*, *Q. texana*, and *Juniperus ashei*), and found that decomposition varies due to structural carbon differences between plant taxa. We repeated this sampling to determine if litter decomposition differed in 2014 and 2015 due to differences in precipitation. Results of this are found below. Additionally, we conducted a soil moisture study to determine how soil moisture varies among locations at Wild Basin.

Our primary goal was to determine the interannual variation in vegetation structure of Wild Basin as well as to determine how structure dictates ecosystem function. Within this in mind, our primary questions were:

i. Does plant community composition differ among 2013, 2014 and 2015?
ii. How does leaf litter decomposition vary among the dominant graminoids at Wild Basin?

This study provides a better understanding of how vegetation structure varies year to year by adding to the data collected in 2013 and 2014 and linking these to interannual differences in precipitation and temperature. This study provides an estimate of how vegetation structure controls ecosystem function, namely how carbon loss due to respiration via plant leaf chemistry differs among years, adding to the understanding we have for the tree species.

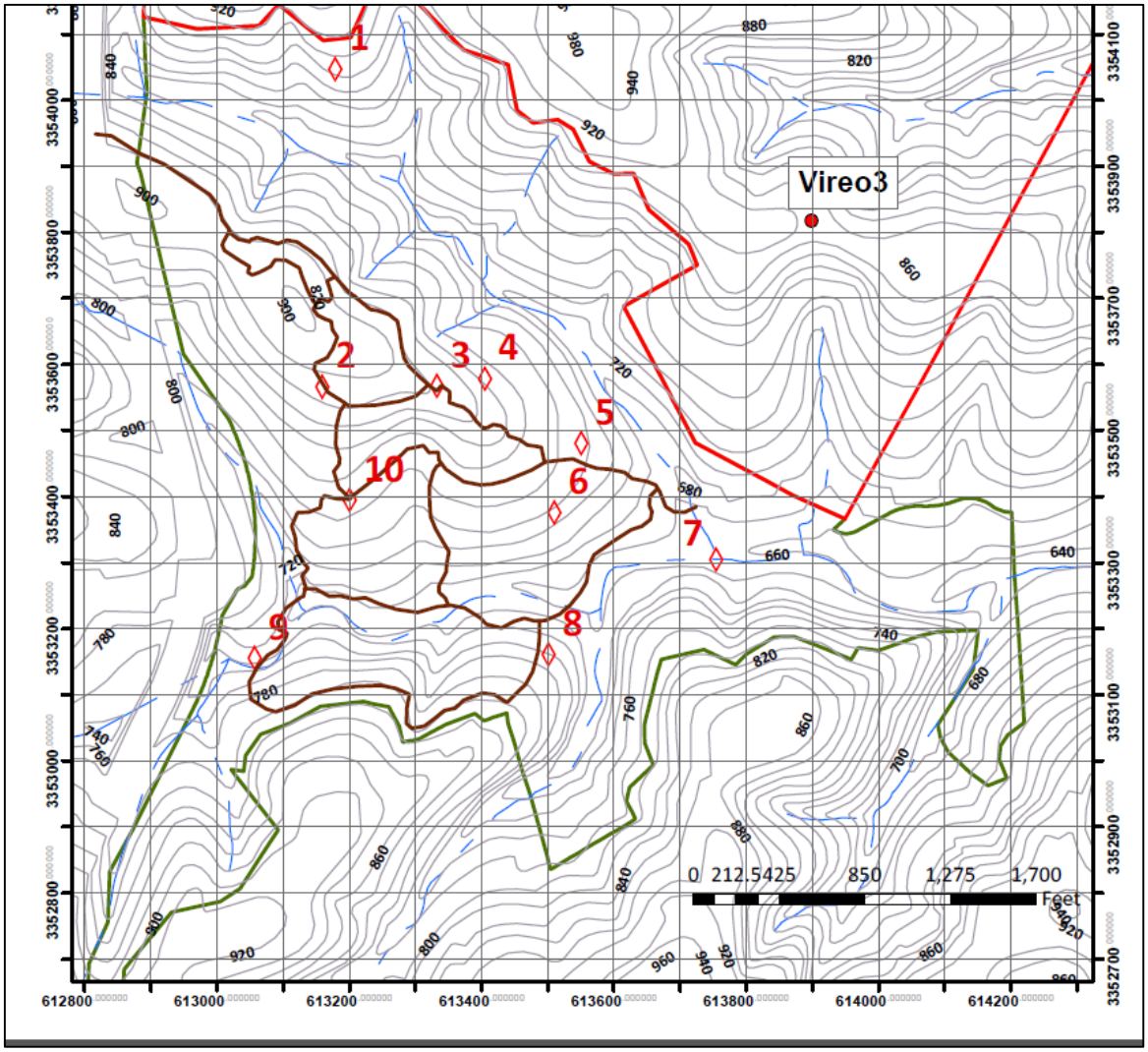


Figure 1. A map of 10 photo points (diamonds) located within Wild Basin Preserve. The point marked Vireo 3 is within the BCP Vireo Preserve, was sampled in 2013, but will not be included in this study.

**METHODS**

This project was conducted within Wild Basin Preserve near photopoints which are mostly located within a few meters of the trail system (Figure 1). Between 19 May and 19 June, we reestablished the three transects and nine plots sampled in 2013 and 2014 at each photopoint. Each transect consists of one 30 m transect to determine tree canopy structure. Three plots are located at the 9, 18, and 27 meter marks along the transect. Plots consist of 50 x 50 cm quadrats and are used to determine understory vegetation.

We recorded the species composition of tree canopy species using a line intercept method and ground cover/understory vegetation using a point-frame method (Inouye 2002). Data were entered into a relational database for analysis and comparison with composition in 2013 and 2014.

We collected senesced but attached leaves from the three tree species (*Quercus fusiformis*, *Q. texana*, and *Juniperus ashei*). These were returned to St. Edward's campus and placed in litter bags constructed of standard shade cloth. Litterbags (approximately 10 cm x 10 cm) were then returned and

buried within the leaf litter near the plots described above in each plant community. After two weeks, litter bags were removed from the field and returned to St. Edward's campus for massing.

Species cover and abundance data were combined with data collected in 2013 and 2014. The following analysis is currently in progress. Together these will be summarized, and communities and years will be delineated using hierarchical cluster analysis (McCune and Grace 2002). To determine how communities are structured, data will then be analyzed using ordination techniques such as non-linear multidimentional scaling. Using the results from this ordination, we will then look for changes among communities, determine the direction and magnitude of these and determine if difference between years correlate to differences in temperature and precipitation collected by the nearest NOAA MET station. Estimates of leaf litter decomposition rates will be compared among species using ANOVA with plant species as the main effect.

**RESULTS**

Currently, the analysis of the combined community analysis for all years is in progress. Preliminary results suggest higher gramminoid and forb cover across all communities in 2015, relative to 2014 and 2013. This may reflect greater precipitation. Both deciduous and evergreen tree/shrub cover has slightly increased across years across all communities. The leaf decomposition study suggests that decomposition was also greater in 2015 than in 2014, again perhaps reflecting differences in precipitation between the two years. A large analysis of all years data is in preparation for publication in appear reviewed journal for 2016.

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